

MATH 144: TECHNICAL MATHEMATICS

Citrus College Course Outline of Record

Heading	Value
Effective Term:	Spring 2022
Credits:	5
Total Contact Hours:	90
Lecture Hours :	90
Lab Hours:	0
Hours Arranged:	0
Outside of Class Hours:	180
Prerequisite:	Elementary algebra or higher or direct placement based on multiple measures.
District General Education:	A3. Mathematics
Transferable to CSU:	Yes
Transferable to UC:	No
Grading Method:	Standard Letter, Pass/No Pass

Catalog Course Description

Reviews and extends concepts from elementary algebra and geometry, and introduces new content from trigonometry, statistics, and other mathematical topics that can be applied to problems that arise in a career and technical setting. Simplifying algebraic expressions, functions, basic graphing, systems of linear equations, linear and quadratic equations, triangles, circles, quadrilaterals, polygons, prisms, spheres, cylinders, statistical graphs, measures of central tendency, measures of variation, normal distribution, right-angle trigonometry, radian measure, Law of Sines, Law of Cosines, sine and cosine graphs, binary and hexadecimal numbers, measurement, metric system, signed numbers and powers of ten. Emphasis is on technical applications and problem-solving skills including the appropriate use of technology. 90 lecture hours.

Course Objectives

- Become knowledgeable of both the metric system and the U.S. system, and apply conversions between the two systems.
- Compute the perimeter and area of a wide range of two dimensional Geometrical figures, and solve various applications involving such concepts.
- Compute the surface area and volume of a wide range of three dimensional Geometrical figures, and solve various applications involving such concepts.
- Apply trigonometric ratios to solving for the angle or side of a right triangle, and apply these concepts to solving related applications.
- Graph the sine and cosine functions, and understand the meaning of the amplitude, period, and phase shift of such functions.
- Apply the law of cosines and sines to solve a wide range of applications.
- Represent statistical data in graphs and tables, and then analyze such information to search out patterns in the data.
- Add, subtract, multiply, and divide signed numbers and fractions and work with numbers in scientific and engineering notation.
- Compute measures of central tendency, variation, and position for statistical data.
- Solve problems involving probabilities by using standard rules and formulas as well as probability distributions such as the normal distribution.
- Convert decimals to binary numbers and hexadecimal numbers and vice versa. Also, perform key operations on binary and hexadecimal numbers.
- Apply accuracy and precision for measurement purposes and compute percent and relative error.
- Add, subtract, multiply, and divide polynomials.
- Solve a wide range of linear and quadratic equations, and apply such knowledge to solve various types of applications.
- Work with ratios and proportions, and apply this knowledge to solve problems involving direct and indirect variation.
- Plot points and graph lines on the Cartesian Coordinate system as well as compute the slope and determine the equation of a line.
- Factor a wide range of polynomials.
- Graph parabolas in the Cartesian Coordinate system.
- Understand the concept of an imaginary number, and how to perform mathematical operations on such numbers.

Major Course Content

1. Signed Numbers and Powers of 10
 - a. Addition of Signed Numbers
 - b. Subtraction of Signed Numbers
 - c. Multiplication and Division of Signed Numbers
 - d. Signed Fractions
 - e. Powers of 10
 - f. Scientific Notation
 - g. Engineering Notation
2. Metric System
 - a. Introduction of the Metric System
 - b. Length
 - c. Mass and Weight
 - d. Volume and Area
 - e. Time, Current, and Other Units
 - f. Temperature
 - g. Metric and U.S. Conversion
3. Measurement
 - a. Approximate Numbers and Accuracy
 - b. Precision and Greatest Possible Error
 - c. The Vernier Caliper
 - d. The Micrometer Caliper
 - e. Addition and Subtraction of Measurements
 - f. Multiplication and Division of Measurements
 - g. Relative Error and Percent of Error
 - h. Color Code of Resistor's
 - i. Reading Scales
4. Polynomials: An Introduction to Algebra
 - a. Fundamental operations
 - b. Simplifying Algebraic Expressions
 - c. Addition and Subtraction of Polynomials
 - d. Multiplication of Monomials

- e. Multiplication of Polynomials
 - f. Division by a Monomial
 - g. Division of Polynomial
5. Equations and Formulas
 - a. Equations
 - b. Equations with Variables in Both Members
 - c. Equations with Parentheses
 - d. Equations with Fractions
 - e. Translating Words in Algebraic Symbols
 - f. Applications involving Equations
 - g. Formulas
 - h. Substituting Data into Formulas
 6. Ratio and Proportion
 - a. Ratio
 - b. Proportion
 - c. Direct Variation
 - d. Inverse Variation
 7. Graphing Linear Equations
 - a. Linear Equations in Two Variables
 - b. Graphing Linear Equations
 - c. The Slope of a Line
 - d. The Equation of a Line
 8. Systems of Linear Equations
 - a. Solving a pair of Linear Equations by Graphing
 - b. Solving a pair of Linear Equations by Addition
 - c. Solving a pair of Linear Equations by Substitution
 - d. Applications involving a Pair of Linear Equations
 9. Factoring Algebraic Expressions
 - a. Finding Monomial Factors
 - b. Finding the Product of Two Binomials Mentally
 - c. Finding Binomial Factors
 - d. Finding Factors of Special Products
 - e. Factoring General Trinomials
 10. Quadratic Equations
 - a. Solving Quadratic Equations by Factoring
 - b. The Quadratic Formula
 - c. Applications involving Quadratic Equations
 - d. Graphs of Quadratic Equations
 - e. Imaginary Numbers
 11. Geometry
 - a. Angles and Polygons
 - b. Quadrilaterals
 - c. Triangles
 - d. Similar Polygons
 - e. Circles
 - f. Radian Measure
 - g. Prisms
 - h. Cylinders
 - i. Pyramids and Cones
 - j. Spheres
 12. Right Triangle Trigonometry
 - a. Trigonometric Ratios
 - b. Using Trigonometric Ratios to Find Angles
 - c. Using Trigonometric Ratios to Find Sides
 - d. Solving Right Triangles
 - e. Applications involving Trigonometric Ratios
 13. Trigonometry with Any Angle
 - a. Sine and Cosine Graphs
 - b. Period and Phase Shift
 - c. Solving Oblique Triangles: Law of Sines
 - d. Law of Sines: The Ambiguous Case
 - e. Solving Oblique Triangles: Law of Cosines
 14. Basic Statistics
 - a. Bar Graphs
 - b. Circle Graphs
 - c. Line Graphs
 - d. Other Graphs
 - e. Mean Measurement
 - f. Other Average Measurements and Percentiles
 - g. Range and Standard Deviation
 - h. Grouped Data
 - i. Standard Deviation of Grouped Data
 - j. Statistical Process Control
 - k. Other Graphs for Statistical Data
 - l. Normal Distribution
 - m. Probability
 - n. Independent Events
 15. Binary and Hexadecimal Numbers
 - a. Introduction to Binary Numbers
 - b. Addition of Binary Numbers
 - c. Subtraction of Binary Numbers
 - d. Multiplication of Binary Numbers
 - e. Conversion from Decimal to Binary System
 - f. Conversion from Binary to Decimal System
 - g. Hexadecimal System
 - h. Addition and Subtraction of Hexadecimal Numbers
 - i. Binary to Hexadecimal Conversion
 - j. Hexadecimal Code of Colors

Suggested Reading Other Than Required Textbook

The text book will suffice for the class.

Examples of Required Writing Assignments

See above example of written work within an outside assignment.

Examples of Outside Assignments

Apply mathematical concepts to CTE problems. An example would be to solve a problem using limited resources to increase engine performance. For example, a student may be given a choice of purchasing a new camshaft or rocker arm to improve engine performance. After determining which is more cost effective and is the easiest to install, they decide on a rocker arm. The rocker arm ratio compares the lifter movement at the cam lobe and actual valve lift. This ratio is typically 1.5:1. Typical ratio computations can be made at this point for different

maximum valve lifts. Also, as the valve train increases so does friction. They will have to use the ratio to compute valve lift for different ratios and different lobe lift values. This will help determine which rocker arm fits best given problems with friction.

Instruction Type(s)

Lecture, Online Education Lecture